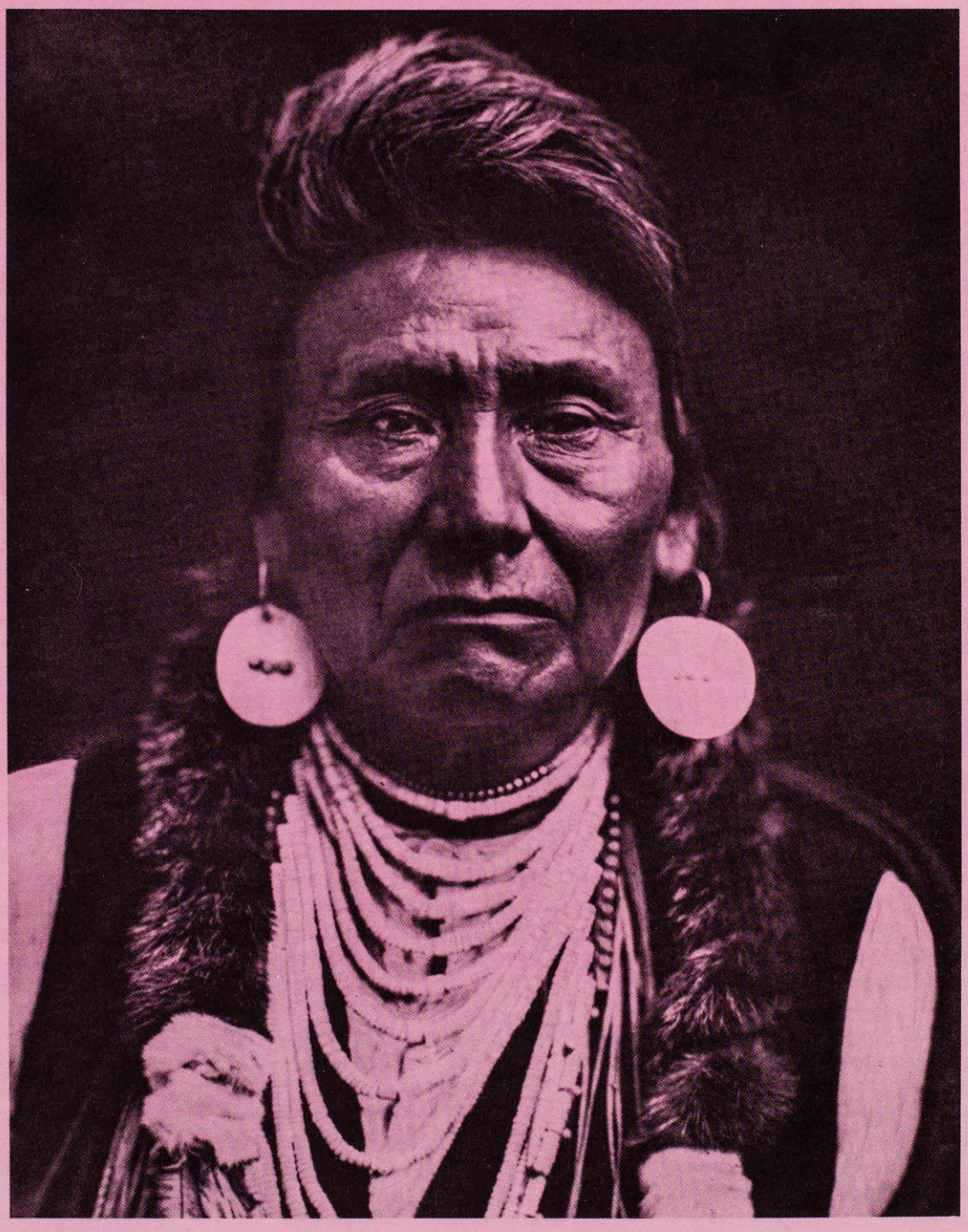
THE MEMBERS MAGAZINE OF THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

Terra

VOL. 14 NO. 2 FALL 1975



Chief Joseph, Nez Perce — *Edward S. Curtis*

Adventurous Alliance

Santa Barbara Island Expedition

In August the Museum Alliance offered its members an odd opportunity: to camp for four days with around twenty strangers on a one-mile-square island with no trees, no water, and no permanent people or plumbing. Taken! The first notice of this expedition brought such a flood of applications to Museum Alliance Secretary Fran Kellough's office that four such trips had to be scheduled and still there was a waiting list of over a hundred.

The hundred or so Alliance members who went to Santa Barbara Island are not likely to forget their adventure to this unspoiled spot which, with Anacapa, makes up the Channel Islands National Monument.

The boat loaded with people, duffels, food, and water jugs took four hours to sail the forty miles from Oxnard to the east side of Santa Barbara Island where, says the page handed out by the summer-only ranger, a landing may be made in relatively calm weather if you "watch out for heavy surge." A little skiff took passengers and packages to shore, where everyone scrambled onto rough rocks and unloaded cargo via a human chain up the precipitous path. The ranger and a burrowing owl watched the process.

At the top of the steep trail everyone looked for flat camping spots on the wild grass or bare ground, while the two young cooks organized the foodstuffs.

Dr. Edward Wilson, Curator of Invertebrate Paleontology at the Natural History Museum of Los Angeles County, was guide and teacher for this fourth trip, as he had been for the first. (Leaders of the second and third trips were Dr. Donald Patten, Curator of Mammalogy, and Dr. Camm Swift, Associate Curator of Ichthyology.) Dr. Wilson was aided by Peggy McCain, the remarkable docent who thought up the idea for the expedition in the first place, and worked for months to plan every detail with good cheer and great charm.

Each day Dr. Wilson led the group on field trips which culminated in picnics on windswept cliffs, followed by free afternoons for hiking and more exploring, reading, or swimming for the young or hardy.

We hiked narrow trails through tall rye grass, African ice plant (purple, squishy, and salty), and strange coreopsis bushes, to the two peaks of the island, and peered over crumbling cliffs at sea lion rookeries or rocks covered with sleek black cormorants. Gulls cried and dived as we inspected the few remaining eggs, infertile but still a source of hope to a few die-hard would-be mother birds. Pelicans sailed silently out to fish. Burrowing owls sat staring out of caves.

We had never seen an owl pellet before. Dr. Wilson pointed out the lumpy gray thing by the trail and explained that owls eat the mice (the only native land mammal on the island) until they accumulate a certain amount of fur and bone in their stomachs; then, whoops, up it comes in a little ball. The mice, having eaten their fill of the third expedition's equipment, left our fourth group alone.

photos by Kilbee Brittain

One morning we dug for fossils by a beach where the resident sea lion family milled about in the cove, staring at us and bristling their whiskers out in curiosity. One afternoon we clambered down Cave Canyon, so named for the many caves eroded by the ocean when the land was submerged tens of thousands of years ago. One day we picnicked on a cliff near Webster Point while watching sleeping elephant seals and playing sea lions. One time we sifted shells in an Indian midden. And then one day it was, unfortunately, time to go home.

We had made several discoveries. High on a cliff Dr. Wilson came upon fossil snails not found on Santa Barbara Island, despite considerable searching, since 1869. A teenage boy, digging with Dr. Wilson in Graveyard Canyon, dug up the bone of an extinct flightless auk, a species never be-

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Printed by North Hollywood Printing Co., Inc.
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Kinabalu: Borneo's Sacred Mountain of the Dead

by **Christopher Davidson**

Long the eternal resting place of the dead and sacred above all other places, Mt. Kinabalu has since the mid-nineteenth century attracted the attention of numerous biologists because of its unique flora and fauna. In March of 1851, Sir Hugh Low, Colonial Secretary in Labuan, became the first European to overcome the heroic defenses of the local Dusun people and climb close to the summit. Several others who tried after him were successfully repelled, but Low and Spencer St. John reached the second highest point on their second try in 1858. By the turn of the century, five or six of the world's most intrepid explorers had made expeditions onto the mountain to study its birds, butterflies, and plants. Having invested Kinabalu with a wealth of legenday lore to rival that of Mt. Fuji, the Dusuns were not easily persuaded to become guides and porters for these summit-bound parties. Souls of the departed found their eternal havens here, followed by phantom buffalo grazing on still more shadowy grasses. Each ascent required the performance of powerful rites to acknowledge the "Hantu," the spirits of the dead, usually by a priest who, with a bundle of charms consisting mainly of pig tusks, scattered rice on the ground and made offerings of eggs and chickens. Originally seven eggs and seven chickens were needed, but this requirement was relaxed by the 1920's. Four gunshots were also found to be necessary, and these ceremonies were always carried out at specific localities, for instance at Paka Cave, a large overhanging boulder beneath which twenty men could crowd together in a heavy rainstorm. The use of the words "Kinabalu" or "Nabalu," meaning "Greatest of All," was prohibited, and the mountain was simply referred to as "Agayoh Ngaran" or "Big Name."

As a result of these early trips an opinion emerged that Kinabalu's great size and isolated position in the Malesian Archipelago had allowed the development of a most unusual assemblage of plants and animals, all neatly occupying unique ecological homes provided on this mountain and nowhere else on earth.

Seen from Kota Kinabalu, capital city of Sabah (formerly British North Borneo), park headquarters at Kinabalu National Park, or almost any other point west, this gigantic excrescence of granodiorite has a most stalwart and formidable shape. It is not an old mountain at all in geological time span, but instead can be traced to the early Pleistocene Age, about one to one-and-a-half million years ago, when its elevation was perhaps three thousand to four thousand feet. Before this, the general area had been subject to several cycles of uplift, or minor mountain building, and erosion, only to return each time to near sea level. By mid-Pleistocene times, less than a million years ago, the great plug of granodiorite, a rock very similar to granite, had been uplifted to its present summit point of 13,455 feet, although the appearance of the mountain must have been somewhat different from what it is today because of the lesser amount of erosion. In addition, long scratches and gouges and polished spots on the bare rock near the top are considered to be evidence of local glaciation about mid-Pleistocene time when some parts of the tropics were much cooler than today.

Now that Sabah is a little easier to get to and "the wild man of Borneo" is an obsolete cocktail party conversation topic, many changes are taking place. Mount Kinabalu is no longer guarded by a legion of Dusuns, and an average of one party a day consisting of one to three people makes the climb to the sumit. Most of the people in this average number are school kids from Kota Kinabalu who make the trip on their vacations. Initially, this may appear to take the edge off the climb, but because this mountain is still one of the most interesting botanical and zoological regions in Southeast Asia, a biologist does not need to be con-

cerned with performing an unusual or difficult feat. Even today new plants and animals are discovered at an amazing rate by expeditions seeking new routes to the top of the great massif.

My own expedition was not geared to finding new species, but instead to a general botanical reconnaissance. I was accompanying Dr. E. F. Anderson, my former biology professor from Whitman College, who had made the arrangements for us to stay overnight at the park headquarters before the early morning climb was to begin. We arrived by Landrover after a very cramped seven-hour trip from Kota Kinabalu, and having deposited our equipment and supplies in our cabin, we made a few short trips out into the forest — the first rain forest I had been in for several years — to see what was going on. Toward the Kiau Valley, the path was lined by massive columnar tree trunks, draped in their upper reaches with tortuous lianas, bird's nest and filmy ferns, epiphytic orchids, and even a few small bushes. Epiphytes are plants that live in tree branches or in crotches of the limbs or on rocks or in other similar places, but never on the ground. They derive their nourishment from accumulated debris and organic matter and are obviously dependent on a rather humid atmosphere, at least during their growing season.

Contrary to frequent rumors about tropical vegetation, the jungle is not always impenetrable. Along lowland rivers and streams, in mangrove areas at river mouths, or where logging operations have caused great disturbance, this is true: nothing short of a bulldozer will make headway. But in primary, uncut rainforest, so little light reaches the ground level that the understory plants are frequently well-spaced, and one can creep about more or less at will, examining the adder's tongues, pitcher plants, terrestrial orchids, and maiden's hair ferns. The ground is often devoid of herbaceous flowering plant cover except where shafts of light penetrate for a few minutes each day the dense overhead canopy of the gigantic trees. In these small areas one can find gregarious colonies of *Sonerilla,* scorpion's tails, and begonias. Rotting logs and level places are almost invariably smothered by mosses and lichens, those ubiquitous, shade-loving inhabitants of the jungle. More than once I found myself knee-deep in a soggy sea of moss while trying to inspect some tropical rarity just beyond my reach. This experience can be simultaneously romantic and a miserable nuisance. Tiny saprophytic plants like *Burmannia* and the Thread Lily, *Petrosavia,* a relative of the cultivated lily, can be found

Early morning sun highlights the rugged summit of Borneo's Mt. Kinabalu. At 13,455 feet Kinabalu is the highest mountain between New Guinea and the Himalayan highlands of Burma.

At 11,000 feet one is surrounded by dwarf "mossy heath forest" in which the tortuous branches and trunks of the trees are blanketed with mosses, liverworts, and lichens. In the background is bare granodiorite toward the Kinabalu summit.

In places the lower slopes of Mt. Kinabalu are dominated by strangler figs and dammar pine, the source of dammar resin. Seeds of the fig sprout high in the branches of a host tree and then send their roots down to the soil — thus, the "trunk" of the fig is actually a mass of coalesced roots.

The upper canopy of the forest is a complicated ecological zone of tree branches, epiphytes, and lianas.

The tropical genus *Rafflesia* has the largest flowers of all flowering plants. The specimen here of *R. tuan-mudae* from the lower elevations of the mountain was parasitic on the exposed roots of the liana *Tetrastigma* and was sixteen inches across. Sumatran species may be twice this size.

The bud of *Rafflesia,* about the size of a grapefruit, is cut in half to show the internal structure. This is a "male" or pollen-producing flower. Seeds are produced in separate "female" flowers. Attachment to the host root can be seen at the end of Mr. Jenkins' finger.

sporadically throughout this forest. These plants are entirely white, lacking chlorophyll so that, like mushrooms, they must sustain themselves on decaying plant matter.

Underneath a piece of bark in a part of the forest almost too dark to see what we were doing, we discovered some peculiar flattened insects with segmented, armored shells, gaily colored in black and red, which were examples of the phenomenon of arrested development: that is, they reach sexual maturity and reproduce their kind without fully maturing in outward appearance or morphology. It is as though little puppies produced more puppies without bothering to become fully-grown dogs.

We returned to our cabin rather tired, for the elevation at the headquarters was around five thousand feet. Later I went out alone to sketch on the Kiau View Trail. I sat on a rotting log for some time drawing an adder's tongue; the forest was still and quiet, and among my many arboreal companions were *Castanopsis,* a tropical relative of the oak, and *Tristania,* related to *Eucalyptus.* Then utterly without warning, the afternoon clouds that had billowed up the side of the mountain engulfed the knoll on which I was perched; the whole personality of the forest changed from the great sepulchrally silent domain I had sketched to a cacophonic aviary. Every bird imaginable began squawking and warbling to warn unseen invaders in this dense fog that each tree branch was reserved for one individual only. And as the fog rolled onward, some of these huge branches loomed into view and then vanished again. Beneath the *Castanopsis* trees, the green padding of moss that one typically squishes through in this region gives way to a prickly zone of *Castanopsis* cupules that resemble the cupules on our California acorns, except that they support an armory of rigid spines that creep around the edge of one's sandals and bite severely at the offending feet.

Back at the cabin, Dr. Anderson and I spent more than two hours trying to boil some non-minute rice, an arduous task at that elevation.

In the morning we assembled our plant-collecting junk and camping material, and the three Dusun girls we had hired as porters stuffed all of it into their conical wicker baskets, which they then strapped onto their backs. Eighteen katis (twenty-four pounds) is about all they will carry, but in this case, they each had about twelve katis. They wore thin cotton sarongs and blouses and had light sweaters for the summit. Our guide, in an opulent leather jacket, carried nothing, as is the custom. The trail is well-maintained and easy to follow, but a guide

is a park requirement.

At last we were on the way. We left road's end (c. six thousand feet) at 8:00 A.M. and began the long climb on an uncompromising trail that has, I believe, two level places between road and summit — one near Carson's Camp at 7800 feet and the other at Panar Laban at 11,500 feet, our destination for that day. Not too far beyond our starting point, 3,496 steps have been laboriously manufactured from durable old roots,held to the muddy slope with stakes. Tropical mud seems more slippery than other kinds, though this may have been more the effect of the forty-five-degree slope, and without the steps, we would have made little progress.

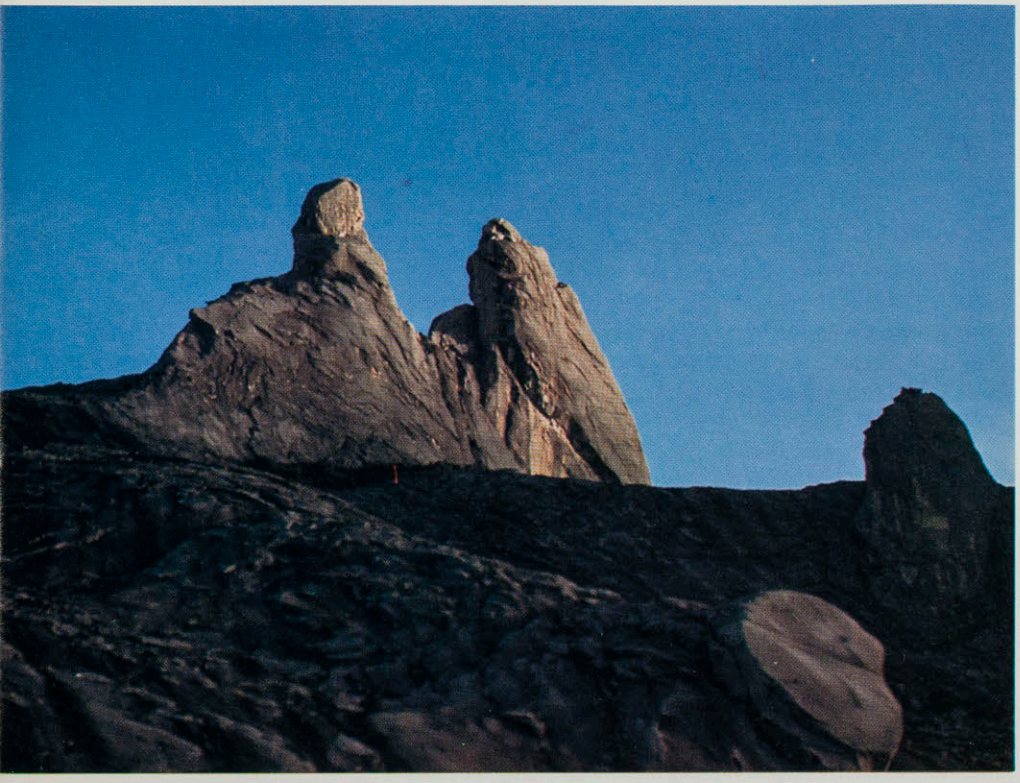
Along the way were thousand of plants, including members of tropical genera like *Lithocarpus* (oak family, with one species growing in California), *Ilex* (holly family), *Aeschynanthus* (African violet family), and *Schima* (Camellia or tea family). Somewhere in this region is a kind of begonia nine feet tall, but we could not find it. *Dawsonia,* the world's largest moss with erect stems up to a foot tall, grows in shady, damp places, as do countless other kinds whose nearest relatives are in Japan or the Himalayas. Three kinds of pitcher plants *(Nepenthes)* with the largest known pitchers, are frequently found at elevations from seven thousand to eight thousand feet and even higher. The leaf tips of these remarkable vines are modified into long tendrils that not only twine about and attach to supporting shrubs and trees but also bear at their ends large cups filled with digestive juices. The hoods of the cups secrete powerful attractants known to be almost irresistible to insects, and many luckless enough to alight on the rim plummet to the bottom where they are prevented from escape by untold numbers of downward-pointing hairs and an unusually smooth surfact that they cannot cling to. Digestion begins at once, and the nitrogen thus obtained supplements the meager supply received from the nitrogen-deficient soil in which these plants grow. The genus name *Nepenthes* was given by Linnaeus and is an allusion from the story in the Odyssey to Helen's drugged wine cup, for he felt that "if this is not Helen's Nepenthes, it certainly will be for all botanists."

Telemachus is supposed to have abandoned all grief for the death of his wife, Penelope, after receiving this famous spirit; and I can testify to one botanist who, if he was not affected in quite so deep a way, at least regarded as anticlimatic every other plant he saw for a long time after that. Curiously, there is a kind of spider that spins its

Polyalthia, a genus related to the cherimoya and custard apple, has three outer and three inner perianth members (or petals, in this species pink and white) forming a tent over the cluster of separate seed-bearing carpels. Many botanists believe that a type of flower construction similar to this but involving more petals was present in Southeast Asian highlands 100 million years ago.

Nepenthes villosa, a species of pitcher plant found only on Mt. Kinabalu, has pitchers ranking second in size among all species of *Nepenthes.* Insects that fall into these flasks are summarily digested and the nitrogen thus obtained by the plant supplements the feeble supply from the soil.

Rhododendron buxifolium shares with another species in New Guinea the highest elevation among some 525 species of *Rhododendron* in Asia. Here is a modest flower cluster photographed at 11,500 feet, where it grows in the mossy heath forest.



The "Rabbit Ears" are warmed up a few degrees by the early morning sun as we near the summit. Visible from the base of the mountain, they quickly disappear and are not seen again until one approaches 13,000 feet in elevation.

web across the mouth of some pitchers and grabs insects before they reach the bottom: there are days when no one gets a break.

No other mountain in the world is known to have more different kinds of figs, and the number of kinds of rhododendrons and whortleberries *Vaccinium*, called cranberries, blueberries, and huckleberries in different parts of the United States), far exceeds that found anywhere else in Malaysia.

As we proceeded from Kambarangoh at 7,040 feet to Panar Laban at 11,500 feet, the trees became progressively more stunted and gnarled, and at the higher elevations, the trail passes through a region of dwarf "mossy forest." The humidity of the afternoon clouds that enshroud this level of the mountain enables a stifling development of mosses and lichens on every branch and even on some of the leaves. The giant trees that had awed us earlier are here either absent or reduced to a man's height, a circumstance that allows the botanist to collect many fine specimens that otherwise would be 150 to 200 feet beyond his reach. Here we found the celery pine, an odd conifer, or cone-bearing tree, that lacks leaves or needles and instead has its branches flattened into fan-shaped structures called "phylloclades." Oddly enough, the botanical name of this tree is *Phyllocladus*. Also abundant are striking, red-flowered rhododendrons *(Rhododendron* buxifolium and *R. ericoides), Leptospermum* and other members of the heath family, and *Drimys* of the Winteraceae.

We arrived at Panar Laban around 12:15, an hour ahead of the porters. We had been told our eighteen-year-old nymphet porters, who were not over five feet tall, would scramble ahead with tireless mettle and cause us much embarrassment, but our overwhelming enthusiasm for this place must have caused us to travel faster than anticipated, despite our large plastic bags full of specimens.

Panar Laban consists of several corrugated tin huts designed for touristss enroute to the summit. A dilapidated heap was intended for use by porters and guides, but fortunately, ours had the good sense to ignore it and move into a much better one that was empty. In fact, we were the only people there. After lunch, the Dusuns relaxed in the sun, chewing betel and expectorating great blobs of orange-colored muck onto the rocks, while Dr. Anderson and I became involved with local forays to see what specimens we could find in the neighborhood. On a grassy bank of the tiny trickle that flows near the huts there lives an endemic buttercup (native to the mountain and found nowhere else), a gentian, and several small

sedges. Botanists and gardeners of north temperate latitudes have been familiar with garden varieties of these plants for years, but they may not have been aware that native species of common temperate garden plants are found on many cool mountaintops in tropical regions of the world, for instance on Mt. Kenya in Africa. Some Kinabalu plants that belong to common American or European groups have their nearest relatives in the Himalayas, such as the rhododendrons and blueberries mentioned before. Many of the birds at this elevation also have their nearest relatives in the Himalayas. Some of them are foolishly tame, a characteristic of birds on isolated islands where predators are absent, another indication of the island-like nature of Mt. Kinabalu. Members of ornithological expeditions have complained that they cannot get far enough away from the friendly warbler to shoot at it.

The night air was clear and cool. I got up once to look at the stars just so I could remember that moment in my old age and not lament about time wasted sleeping.

The early morning spectator is rewarded with a magnificent panorama of the Bornean jungles, seven thousand to eight thousand feet below and not yet blurred by the diaphanous veil of humidity the hot sun would engender in an hour more. By noon this veil would become a cloud cover and begin its daily ascent of the slopes of the "Big Name." Forty miles to the west is the South China Sea, visible in the distance, and fifty-seven miles southwest is Kota Kinbalu.

We all arose early and ate quickly so that we could try to be at the summit for sunrise. The final twenty five hundred feet from Panar Laban was mostly over bare rock along some stretches of which ropes were available for assistance; in others, stones had been cemented to the rock faces for footholds. We left camp at 6:00 A.M. and arrived at Low's Peak at 8:02, well after sunrise, of course, but at 13,000 feet the sun is hard to race against. I took out my pocket altimeter: 13,455 feet on the very mark. Low's Peak, the highest point between New Guinea and the Himalayan highlands of Burma, is a loose pile of rocks standing amid several other projections from the plateau at the top, including Victoria Peak (13,450 feet), St. John Peak (13,440 feet), and the Donkey Ears, which are visible from Park Headquarters. I had the guide and porters sign my notebook: Kidek, Kundah, Kanoi, Aning, and Sianah. Somehow five names got in there for four people. And for a reason we shall never know, I took their ability to write for granted when I asked them.

Low's Gully, an enormous chasm in the side of the mountain, is evidently the true sacred resting place of the dead.

The actual summit is a cairn of loose stones impaled by a few commemorative flags and strewn with cans and bottles containing messages from previous climbers. Our Dusun guide and the three porter girls clambered to the very top despite the cold wind.

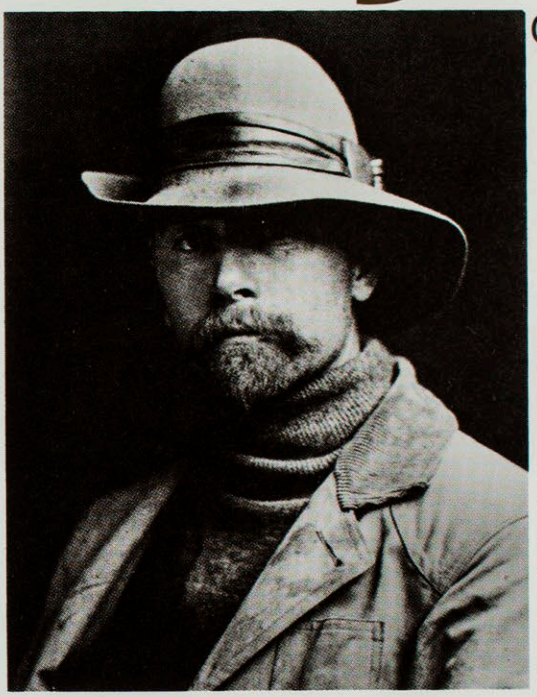
We spent about thirty minutes resting and remembered reading that someone had once seen ice in one of the small water pools by the trail just below us. Here and there the rock bears great claw marks of ancient glaciers, and plants are confined to narrow crannies where a little soil has accumulated. The air was cold, probably in the mid-forties, with a brisk wind. The three girls had on their sweaters, and the guide stood unmoved and stonefaced in his jacket.

Directly below us as we rested was the gargantuan abyss over four thousand feet deep known by the comparatively feeble term "Low's Gully." Once having seen this sight, I could easily appreciate the superstition of the Dusuns, and possibly all the rice scattering and rituals with the chickens and eggs were not such a bad idea. "It costs nothing to be polite and, besides, you never know," as the old lady said when she bowed to the devil's name in church. □

Christopher Davidson researched the material for this article when he visited Malesia while working on his doctoral thesis. He is Curator of Botany, Natural History Museum of Los Angeles County. His specialty is evolutionary biology of flowering plants.

Visions of a Vanishing Race

THE PHOTOGRAPHS OF EDWARD S. CURTIS



Edward S. Curtis, Self-Portrait 1899

by **A. D. Coleman**

Few of us realize our dreams, perhaps because few of us commit ourselves utterly to their fulfillment. Edward Sheriff Curtis was a visionary who gave himself over wholeheartedly to his dream and, working patiently, transformed it into a reality.

As his elegant, formal self-portrait reveals, there was in Curtis–as in his imagery–a sense of drama, a flair for presentation. He saw himself, and portrays himself to us, as a dashing figure, an explorer and adventurer. If in the end we forgive him this theatricality, that is because he more than met its demands by living up to the requirements of legend.

Like all romantics, Curtis set himself a challenge, and a quest. The object of his search was the spiritual core of American Indian life; the challenge was to describe as thoroughly as possible that rapidly mutating and disappearing ethos by rendering aspects of it in three distinct media: sound (he made some 10,000 wax cylinder recordings of songs and ceremonies, 700 of which still survive), written accounts and observations, and photographic images. Curtis' chosen function, his craft, was ethnography; his art was photography.

He began his undertaking in 1898, at the age of thirty, and in the three decades between its inception and its completion he lived a romance epic in scale. Characteristically, it was centered around a battle, fought in Curtis' case against those two most implacable adversaries, nature and time. Even as he commenced his project, the American Indians were becoming a "vanishing race." Each day, each death bit off an irretrievable chunk of that whole which Curtis fought to preserve in his race with the years.

Chance, or fate, was not always kind to his efforts and his salvagings. There were financial difficulties. There were also the greater obstacles of wilderness and weather, precious and fragile glass-plate negatives destroyed by flood, cumbersome yet delicate equipment shattered by the missteps of pack animals. Nor were the elements the only source of danger; not all of Curtis' chosen subjects, long-oppressed and exploited, proved friendly.

Yet these hardships and disappointments were balanced – more than balanced, I should think – by what he received in return; they are only part of the story, and a necessary part at that. They spiced a narrative whose plot was chock full of action and risk (including Curtis' own participation in the nine-day Snake Dance ceremony of the Hopi), set in the majestic spaces of a not yet despoiled American West, and populated with a cast of characters including such figures as Teddy Roosevelt, J.P. Morgan, Chief Joseph, Red Cloud, and Geronimo. All of this was topped by the triumphant conclusion of a full life's work, which was acclaimed in its own day and has found a new and even wider audience in ours. Edward Curtis died in Los Angeles, in 1952; there are those many times as famous who did not accomplish half so much. □

EDWARD S. CURTIS created a work so monumental that it buried itself for more than fifty years.

Curtis certainly didn't intend it that way; his purpose in making *The North American*

Indian was to document all aspects of a marvelous culture which was being inexorably destroyed, in such a way as to retain the spirit of that culture and keep it alive. Yet, in retrospect, it seems inevitable that this towering accomplishment should have fallen into obscurity for half a century, just as it seems fitting that the rediscovery of this work should be taking place at this particular juncture in history.

The North American Indian was Curtis' magnum opus, the result of thirty years of work which took more than a million dollars to achieve its final form. When completed, it comprised twenty volumes of invaluable ethnographic text, and twenty portfolio volumes of incomparable photographs. All in all, there were a total of approximately twenty-five hundred images — one of the largest photographic archives of this sort ever created by a single artist.

The project, backed by such powerful figures as Theodore Roosevelt and J.P. Morgan, received an enormous amount of attention in the press; as the volumes began to appear (the first in 1907) they garnered reviews which were, quite rightly, lavish in their praise. Yet the neglect which this labor of love suffered until recently was, in a peculiar way, its own fault.

Issued in an edition limited to five hundred sets and priced at $3,000 per set, *The North American Indian* was aimed at museums, well-endowed libraries, and wealthy private collectors. More than three hundred of the sets were sold fairly quickly to such buyers.

And in those hands they vanished. They were not deliberately hidden; they were merely so large that they hid themselves. Automatically, they were placed in the Rare Book Rooms of the institutions which housed them, thus becoming invisible. Only rarely were they cross-indexed under Photography in card catalogues, for they were thought of more as ethnographic treatises than as photographic documents. Out of easy reach even for scholars, remote from the general public, they were easy to forget.

Thus, while ironic, it is also understandable that the name of Edward S. Curtis appears in none of the major volumes of photographic history. After all, even his obituary in The New York Times mentioned his photographic work only once, in passing.

It would be natural to assume that the upsurge of interest in the photographs of Curtis is attributable primarily to the widespread "rediscovery" of American Indian culture which began in the middle 1960's. This new awareness, however, is neither the sole nor the primary cause of the Curtis revival. If it were, one would logically expect to see a similar, concurrent resurgence of interest in other photographers of Indians — William H. Jackson, Timothy O'Sullivan, F.A. Rinehart, and many more. But the work of these men has achieved no new prominence, and for good reason: the photographs of Edward S. Curtis are not only vastly different from, but far superior to, theirs on almost every count, and unless another unknown giant still lurks on the reserve shelves of some library *The North American Indian* will probably come to be recognized as the most profound document of pure Indian culture ever made.

To be sure, Curtis had several advantages over the photographers who preceded him in the nineteenth century. His equipment was somewhat more sophisticated than theirs had been (though that alone hardly accounts for the qualitative differences in the imagery of these men.) He had more time for — or, to be accurate, *devoted* more time to — studying his subject in the field. He had access to the work of his predecessors, so that he could learn from their limitations and oversights, and had access as well to a far larger body of historical & ethnographic information about the Indians than did any previous photographer. Furthermore, by the time Curtis began his work, at the turn of the century, the Indians had lost most of their "superstitious" (though hardly baseless) fears of having their spirits stolen by the camera's eye.

But these advantages were balanced by the many difficulties Curtis was forced to overcome. Unlike Jackson, O'Sullivan, and other early photographers, who encountered Indian culture when it was still vital and relatively untainted, Curtis had to deal with considerably modernized Indian nations and find ways to reconstruct the past therefrom. The title of one of his most moving images, that poignantly receding line of riders in "The Vanishing Race", expresses perfectly the tragedy of that stage in Indian history. The task he took upon himself — to explore and record every significant aspect of Indian life — was both more coherent and more demanding in its scope than anything attempted until then. And while the Indians had overcome some of their superstitions about photography, those had been replaced, quite sensibly, with suspicion of the motives of the photographer who persisted in streaming through their world and invading their privacy. Gaining — or, rather, regaining — their trust must be seen as one of Curtis' major accomplishments; exposure to the range of his imagery makes it obvious how intrinsic that trust was to his purpose.

It is that sense of purpose, more than anything, which differentiates Curtis from all other photographers who have recorded the American Indian.* Jackson, O'Sullivan, and the rest were essentially documentarians, intent on capturing in photographs the visual facts, just the facts. Their images *describe* excellently in a scientific fashion, noting in a detached if accurate way the appearance of rituals, the details of costume, the distinctive physiognomical traits of assorted tribal representatives.

Curtis, in contrast, was intent on making not just images *of* but images *about* Indian life. He set out specifically and deliberately, to capture the *spirit* of the Indian lifestyle and invest his photographs with it. This goal, which he pursued with an almost fanatical selflessness — and which, as his results attest, he successfully achieved — is what distinguishes him from all who came before. Content with recording surfaces, others defined themselves implicitly as visual stenographers, while Curtis, insistent on rendering not only the surface but the substance, the very ethos of Indian life, became by virtue of that choice an *interpreter* of his subjects.

This may be taken as another way of saying that Curtis chose to function as an artist, but that word is semantically loaded and not necessarily significant in a response to photographic imagery. I use the word "interpreter" advisedly, then, to imply that Curtis imposed on his subject matter not only his own way of seeing (which all photographers impose) but also his personal, interior vision of what they were and what they symbolized.

MAKE NO MISTAKE about it: there may be such things as "objective" photographic documents, but Curtis' works are not among them. His body of imagery forms one man's intensely subjective record of his own responses to other people and their cultural matrix, an interpretive essay on an entire people and their way of life.

Because it does not pretend to objectivity, we tend naturally to question a work such as this. Are these actually photographs of the Indians, or indirect portraits of Curtis himself? Is the romanticism which resounds throughout his work anything more than another white man's uncomprehending sentimentalization of an alien culture and philosophy? Can we, to get to the heart of this issue, trust Curtis' vision and accept

*One photographer who must surely be excepted from this evaluation is Laura Gilpin, whose deeply committed studies of contemporary Indian life are truly a continuation of Curtis' labor of love.

Canon De Chelly, Navajo

what it reveals to us as true?

To answer this last question, we must come to terms with Curtis' style, his vision, and the relationships between them.

A glance through his images will indicate that Curtis was inarguably a stylist. His mastery of natural light as a modeling tool in the portraits, his unstrained but highly structured compositional sense, and his flair for recognizing instants of epiphany in his dramatic tableaux, all point to a highly developed and classically influenced way of seeing. Curtis knew how he wanted his photographs to look individually, and was obviously aware of the overall appearance of his total body of work as well.

His vision — that is to say, his understanding of what he saw, above and beyond his way of seeing it — is unabashedly, even incurably, romantic. Webster defines romanticism as "signifying . . . the spirit of chivalry, adventure, and wonder, the preoccupation with picturesque and suggestive aspects of nature, and with the passionate in life." The work of Curtis could hardly be described better or more succinctly.

Since his style consistently echoes and reinforces his vision, Curtis' images are anything but accidental. Not only are they all carefully planned and previsualized, but, like pieces of a jigsaw puzzle, they are consciously designed to fit together in order to create the unity of that larger whole which is *The North American Indian.* And, because it is infused with that encompassing personal response to, and interpretation of, the subject, the work of Curtis must be seen as a simultaneous portrait and self-portrait, a blend of fact and feeling which demands a response as strong as the commitment which went into its making.

Why are we willing to make this response? Why, when we know that romanticism of a different kind has distorted our perception of the Indian, are we able to trust those photographs, to certify a truth quotient in their message?

In the last analysis, it seems to me that we trust the images of Curtis because it is obvious from even one — any one — of the portraits that his subjects trusted him first and trusted him deeply, and that this trust was never betrayed.

I suspect that they trusted him as they did not despite his romanticism but because of it; it was a match for their own. Pragmatic and unsentimental though it was, the Indian world view was also quintessentially romantic in the very best sense of the word, and the dictionary definition quoted above fits Curtis' subjects as closely as it fits the photographer himself. They were spokesmen for each other, Curtis and the Indians, and if these images are in one sense a self-portrait of Curtis they are also, in that same sense, the visual autobiography of Indian culture. The combined sensibilities of all participants in these photographic acts are merged in the resulting images.

Yes, the Indian vision of the universe was basically romantic, as was the cultural style and even the setting. One cannot easily determine where Curtis leaves off and the Indians begin, they are so entwined: look at "The Storm — Apache," "The Vanishing Race," and "The Apache Reaper." And his love for the shapes created by the interaction between the prople and their land — another romantic trait — can be seen in such images as "A Mono Home," with its complex patterns of baskets, house, hills, and clouds.

Because Curtis was not imposing his romanticism on his subjects, but rather mirroring their own, he managed to keep his vision expansive and his way of seeing extraordinarily flexible. His images are always immediately recognizable, but they differ greatly from each other depending on the purpose they are intended to serve.

Without setting up rigid categories, I think it is illuminating to note that Curtis worked in several distinct veins, each exploring a different facet of the same culture.

One of these veins concentrates on the artifacts of Indian culture. These creations — baskets, costumes, weapons, tools — are treated by Curtis not simply as things but as manifestations of the Indian spirit. His photographs make them animate, and always reveal the beautifully functional shapes and textures of these works. It is significant, though, that no matter how remarkable it may be in its own right no artifact in any of Curtis' images is permitted to steal the scene from a human subject. Though the costume worn by "Wisham Girl" is stunning, Curtis relegates it to second place in the hierarchy of content — a stylistic decision which is also a philosophical stance.

Another of Curtis' interests was work — the tasks necessary to support life and the ways in which they were performed. Fishing, reaping, weaving, along with many other skills and crafts, were explored by Curtis in a way which recorded not only the significant tools and motions but also the spirit in which the work was done. "The Potter Mixing Clay," for example, is a powerful study which conveys not only the basic craft information but also the potter's own emotional connection with the earth and her own mortality.

There are numerous other sub-genres (such as records of daily life) which will become apparent as one experiences his images again and again. Each serves to probe a specific area of Indian culture and is a variant — always with appropriate modifications — of Curtis' central style.

Two of these sub-genres, however, are particularly noteworthy in that they are the most emotionally charged sectors of the total document, the ones which would probably raise the most skepticism among ethnographers but which are nevertheless, for almost everyone who sees them, the most memorable: the portraits and the tableaux.

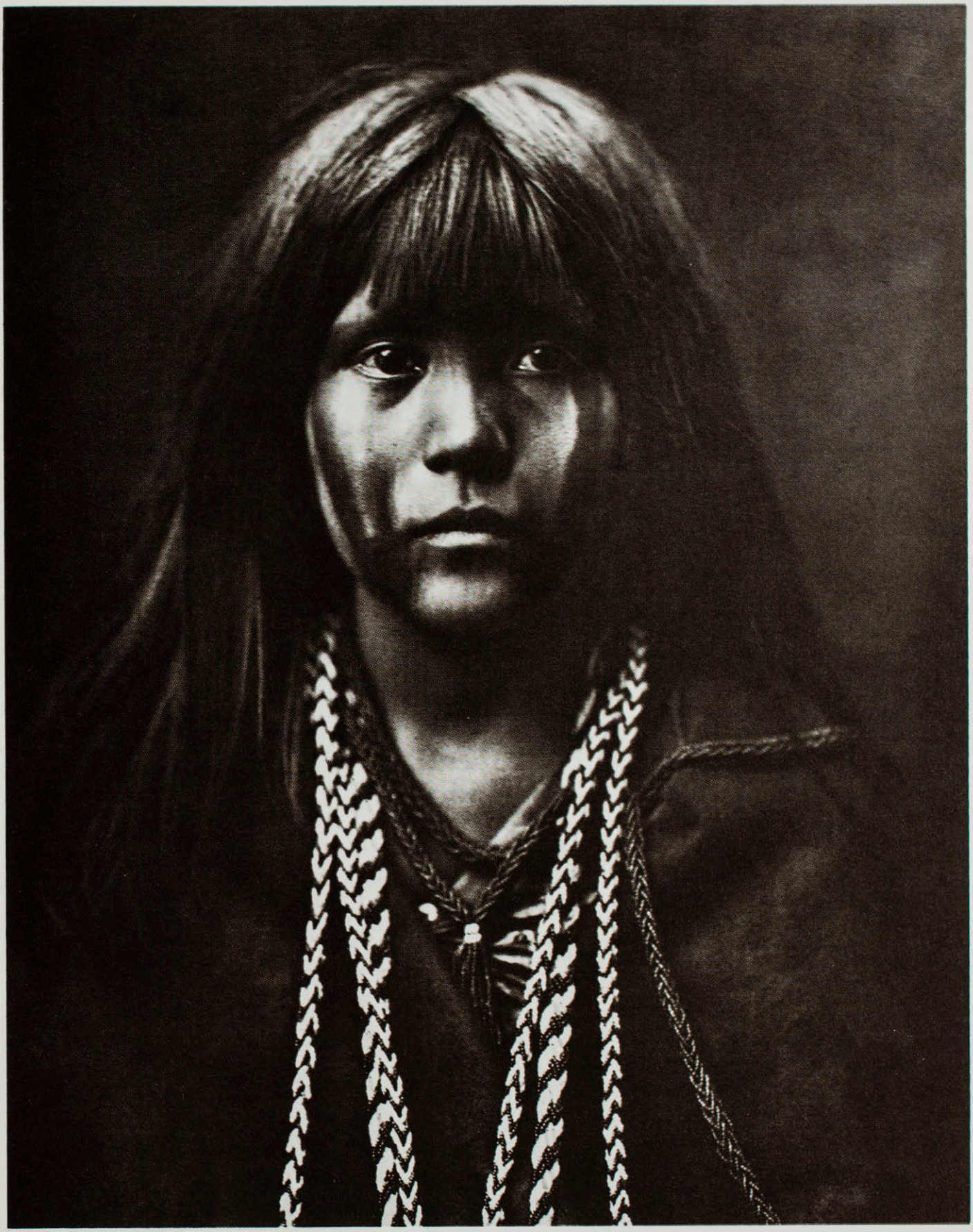
THE PORTRAITS are, quite simply, superb. Compositionally, they have a classic purity and strength which seems ageless. Natural light is employed by Curtis in a consistently brilliant way to emphasize both obvious and subtle marks of character in a face, to establish the mood of each individual portrait, and to create an unusual feeling of space within a two-dimensional image.

In these portraits Curtis worked as a cartographer, reading each face as a map of the past and of the character of each sitter. Unlike other Indian photographers, who had photographed their subjects without attention to pose or environment, Curtis sought always to bring out the individual qualities of the men, women, and children before his lens. If his results are successful, and they are, we must recognize that Curtis' efforts were only half of what went into these images; the other half was the willingness of his sitters to reveal themselves with such grace and honesty.

Notice, in his portraiture, how Curtis resists the temptation to let artifacts distract him from the face itself — except in a few cases where some element of apparel is so strong a personal talisman that it is incorporated as part of the sitter's *persona.* Notice too how the people seem to wear the light as though it were a garment, or a second skin.

Most of all, notice the psychological nuances evoked in each image, and the wide range of such delicate inflections to which Curtis was sensitive. The fierce pride of "Coups Well-Known — Apsaroke" is not identical to that of "A Hopi Man", just as the wisdom on the face of "Red Cloud — Oglala Sioux" differs from that of "Wife of Modoc Henry". These are portraits of absolutely individual and highly complex people, each of whom Curtis perceives as a unique being.

AS FOR THE TABLEAUX, such as "Canon de Chelly-Navajo", and "The Three Chiefs-Piegan" — at times they seem like



Mosa, Mohave

dreamscapes, so closely do they match all youthful fantasies of what life in the Old West was like. It is the heroic side of the Indian ethos which is dramatized in these photographs, but it would be a mistake to assume that, simply because there is a romantic streak therein, these images are not true to the texture of their lives. Brooding skies, sweeping vistas, snorting horses — the environment itself is romantic. How then could a people so attuned to the land not be romantic as well? Some of these scenes may have been staged, but Curtis was directing the original cast in its farewell performance, and theatrical events of that sort generate a special, magical truth all their own.

It is to be regretted that Curtis finished his work before making movies in such locations became commonplace; his flair for the dramatic would have made him a marvelous filmmaker, and the Indians surely needed a spokesman in the early days of the film. Many of his images, in fact, seem like stills from a film, and if they are sometimes ambiguous — as is the mysterious "Waiting In The Forest — Cheyenne" — the basic message is nonetheless clear: Here was a great culture which had much to teach us, and we destroyed it. We do not deserve a document of that culture so clear, so profound, and so devoid of bitterness as this one, and yet we have it. To earn it, we must work to understand it. That labor begins with the realization that just as Edward Curtis stole the spirit of the Indians, they in turn stole his. Contemplate these photographs long enough and it may happen to you. □

A.D. Coleman is photography critic for The New York Times and has taught & lectured widely in the US & Canada.

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Kutenai Duck Hunter

CURTIS AT THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

During the month of December, 1975, the Los Angeles County Museum of Natural History will hold a special exhibition of original photographs and photogravures from Edward Curtis' monumental work *The North American Indian.* It is appropriate that Curtis should be shown in a major exhibition at this museum for indeed his presence has been felt very strongly here.

The library of the Natural History Museum received as a gift of the General Harrison Otis family in 1931 the twenty volume limited edition set with portfolios of Curtis' *The North American Indian.*

Since that time the Curtis Photographs have played major roles in many exhibits here. The Gallery of Western American Indians, that comfortable and beloved hall comemorating the first peoples of the American West, is built around Edward Curtis' splendid visual images.

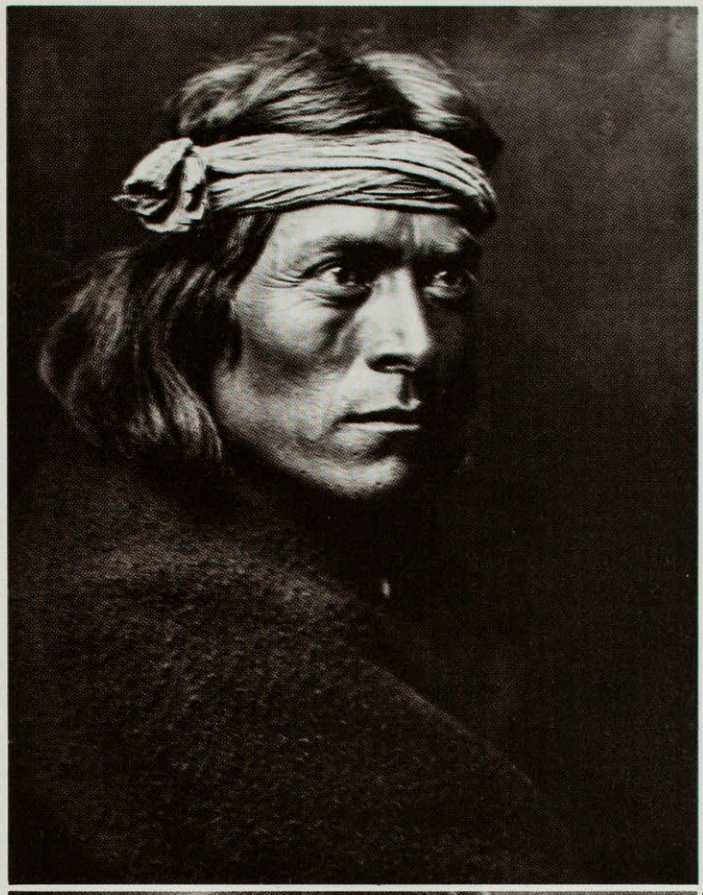
Curtis chose to live in Los Angeles for the last twenty years of his life and it is in Southern California that his children still reside.

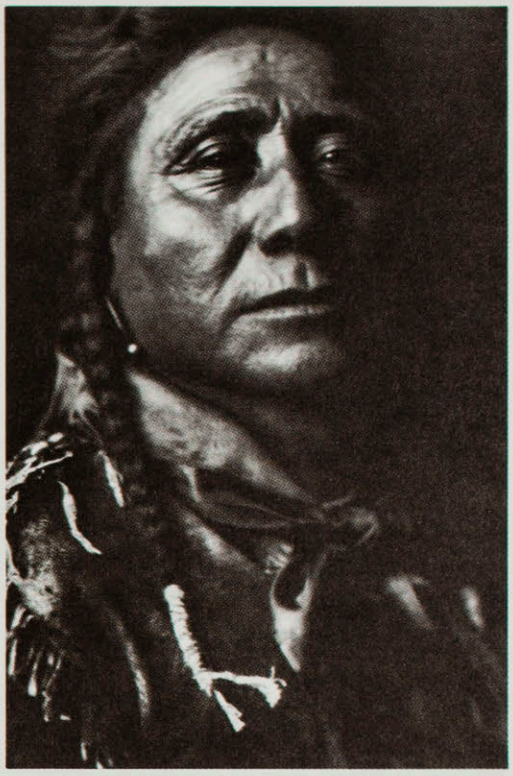
As A. D. Coleman points out in his essay (printed here), the magnitude of Curtis' work may well be what has obscured the man until so recently. Never has such complete documentation been done on a set of cultures in so many dimensions. Curtis was a true ethnographer, recording the ethos of a people as no anthropologist since has been able to match. His photographs are the elegant decoration for the substance of his work, his journals. Edited by Frederick Webb Hodge the journals are as substantive as the photographs are artistic. Here is recorded in print the soul of a people with as much objectivity and sensitivity as anyone ever trained in the art of ethnography.

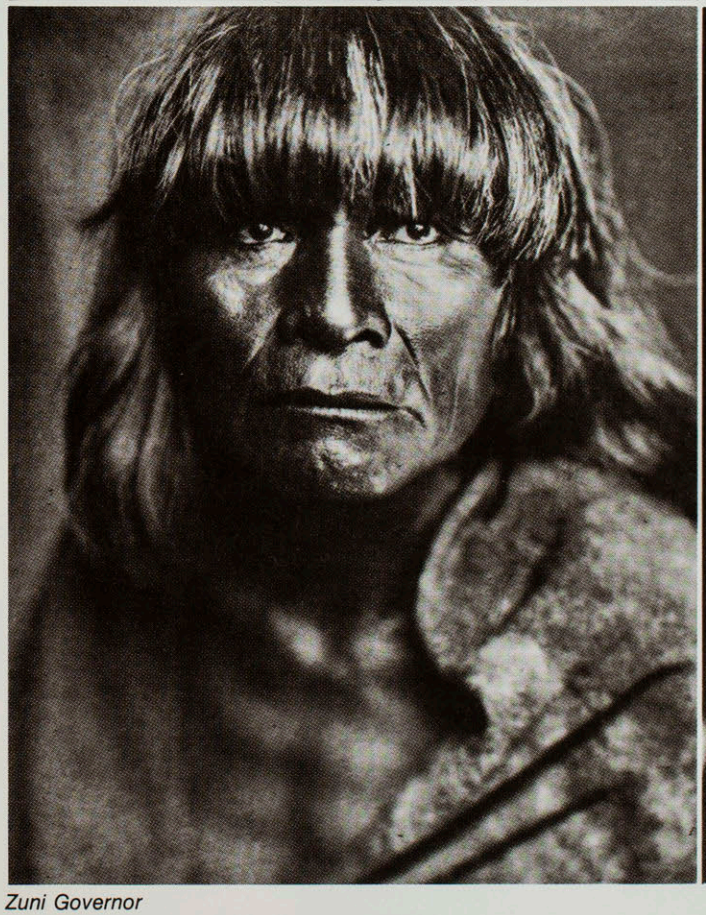
Aside from his photographs and journals Edward Curtis left yet another landmark of documentation, his classic motion picture of Kwakiutl life on the Pacific Northwest Coast. Produced in 1914, the Kwakiutl film, like the rest of Curtis' work, was largely unnoticed until George Quimby at the University of Washington revived the old print. During the week of December 2-6 the Museum will have daily showings of the Kwakiutl film in the Delacour Auditorium at 1:30 pm. The film is but another example of the mastery that Curtis displayed in ethnography.

The Shadow Catcher, dealing with Curtis' life, and showing some of his work, will also be shown on Thursday, Friday and Saturday, December 4, 5 and 6th at 2 p.m.

On December 3, 1975, at 1:30 pm the Museum will host a symposium of anthropologists, film historians, documentarians, photographers, and communications theorists who will convene to discuss, debate and honor the man, the art, the legacy of EDWARD SHERIFF CURTIS.







Zuni Governor

A Hopi Man

Coups Well-Known, Apsaroke

Red Cloud, Oglala Sioux

Atsina Warriors

The Three Chiefs, Piegan

The Wedding Party, Kwakiutl

A Heavy Load, Sioux

ETHNIC ARTS SHOP

Annual Indian Festival and Sale

December 3 thru 7, 1975

Demonstrations by the Artists

Roger Tsabetsaye Zuni Silversmith
Mary Ann Ashley Navajo Weaver
Ernest Hunt Navajo Sandpainter
Debbie Kewanyama Hopi Basketweaver
and
The Tony Purley Tribal Dancers
Guest Lecturer
Bert Berlant
"The Navajo Blanket and Rug"
Saturday, December 6, 1975 11 A.M.

Sale of:

Jewelry: Navajo, Zuni, Santa Domingo, Hopi (Pawn and New)

Blankets and Rugs: Navajo (New and Old)

Pottery, Baskets, Kachinas, Sand Paintings

Photographs by Edward Sheriff Curtis

Wednesday, December 3
through Sunday, December 7

Natural History Museum — **Ethnic Arts Shop**
900 Exposition Blvd., Shop Hours 10 a.m. — 4:30 p.m.
11 a.m. through 3 p.m.
Closed Mondays
Parking: Menlo Ave. State Parking Lot
across street, West of Museum Auditorium
Please use front door entrance.

American Indian Images

by

Edward Sheriff Curtis

1868-1952

Photographic Studies of Tribal Life
On Exhibit December 3, 1975
through January 4, 1976
at the Changing Gallery,
Natural History Museum

Film:
"In The Land of the War Canoes"
(1914 Documentary)
and a Panel Discussion
By Leading Anthropologists
and other Authorities
in the Delacour Auditorium
Wednesday — December 3, at 1:30 p.m.

Film:
"The Shadow Catcher"
Delacour Auditorium Thursday, Friday and Saturday,
December 4th, 5th, 6th
at 2:00 p.m.
Also: KCET, Channel 28
Monday Dec. 1, 10 pm
Sunday Dec. 7, 5:30 pm

The Mass Produced Items of the Victorian Era

by **Donald Chaput**

When the Garland Hall of American History opened in late September, it was a continuation of the Natural History Museum of Los Angeles County's plan of presenting the nation's history in a series of chronologically arranged halls.

In 1972 the first section of the Garland Hall was opened, emphasizing the period from 1870 to 1915. The section opened this year, more than twice the size of the other hall, keeps within the time frame of 1870-1915, but is mostly concerned with technological and industrial developments of the era.

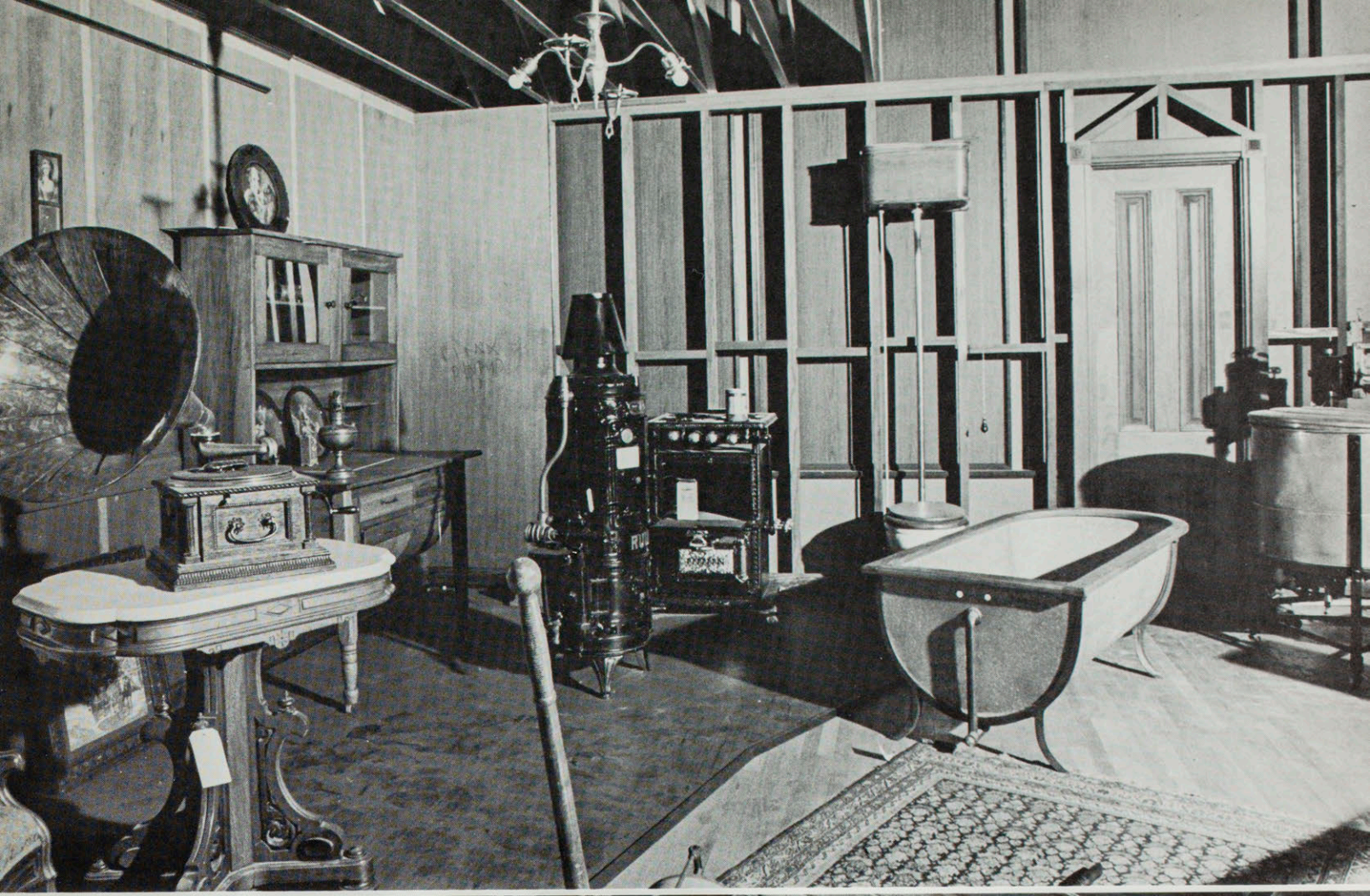
The History Division is currently planning two other galleries to fit into this chronological approach. A hall covering the years 1815 to 1870 is being suggested for the area now serving as a changing exhibits gallery, and the present Early American Hall will be revised to interpret American society from the 1500's to 1815.

The new section of the hall demonstrates how the technological changes in the late nineteenth century drastically altered the social fabric of America. An increasingly uniform American culture began to develop. The agrarian, rural society of mid-century changed in a single lifetime into a modern industrial urban culture.

Major elements of society grew less diverse, and sectional differences were muted. Nonetheless, simple life styles became complex, as the economy became focused on a continual increase in production and an ever-widening distribution of industrial goods. Family life, cultural affairs, politics, agriculture, and manufacturing were transformed, introducing an era of even more rapid change.

The materials in the hall reflect some of these major changes, especially the impact on the growing middle class. The artifacts are commonplace and unsophisticated, illustrating the fact that a large segment of the population could now afford things that an earlier generation might have considered as luxuries.

The west area of the hall consists of a group of mass-produced items from the turn of the century: kitchen cabinet, flush toilet, bathtub, washing machine, icebox, water heater, vacuum cleaner, and light fixtures. Certainly bathtubs and toilets were known in earlier eras, but they were expensive, often custom-made of fine materials. The display pieces were standard mail-order catalogue items, made of inexpensive materials, and were used in thousands of homes throughout the country. Mass production, and a well-developed distribution system, made these products available to a much wider portion of the American



public.

Fast and more efficient transportation made possible the distribution of products throughout the country, and the gallery has exhibits of some of the major types of transportation during the era. The railroads underwent rapid expansion during the Civil War, and following this, lines were extended across the country. By the late 1800's, grain, meat, lumber, and manufactured goods could be shipped by rail to most parts of the country. One gallery exhibit features a railroad telegraph office, showing equipment and messages. A scale model and illustrations point out the significance of the refrigerator cars after the 1870's; it was now possible to ship meat from Chicago to Boston. Other railroad emphasis includes a mural of a California railroad station and a switch from the Denver and Rio Grande Railway. The development of new standards of industrial safety and efficiency are interpreted in an open exhibit comparing the earlier link-and-pin railroad coupler with the first modern automatic coupler.

More than merchandise and raw materials were moved by the railroads. People traveled via rail for long and short distances, to seek new homes and jobs, or simply for recreation. The period from 1880 to 1910 saw the development and growth of a massive streetcar and interurban transportation complex. This cheap urban transportation system accelerated the growth of suburbs and made large-scale commuting possible. The largest exhibit in the gallery will be one of the first streetcars from the Electric Rapid Transit Company of Los Angeles, a firm which began in 1890. The framework of the car is original, and the truck is a model installed around 1910. The streetcar restoration was not completed when the hall opened, so visitors are able now to watch the restoration as it progresses. A panel of illustrations adjacent to the restoration project explains methods and goals.

Other transportation exhibits include a restored 1902 Oldsmobile, a bicycle from the 1890's, and automobile and bicycle repair kits. This was the era of the origin of flight, and the gallery has a model of a Langley flying machine, the Wright brothers' plane, a Curtiss aviation engine, and some early aeronautical instruments.

Technological advances also had a profound effect on agriculture. An 1882 Deering Light Reaper, displayed on a separate platform, helps to interpret these developments. Along the south wall of the gallery is a series of pictures and posters that illustrate the history of that era, covering politics, leisure activities, literature, business, and the military.

A lumbering exhibit contains a ten-foot cross section of a redwood tree, lumbering tools, and logging illustrations. The lumbering exhibit is adjacent to the household exhibit, which shows how the wood was used in the frame construction of many residences.

Much of the work in the new Garland Hall was made possible by the continued encouragement and support of the Garland family. Visitors will especially appreciate the lush new carpeting, which covers both sections of the hall. The carpeting, a first in any of the Museum galleries, will be installed also in future history halls.

The design of the gallery was done by Jack Dixon of the Exhibitions Division. He also prepared a scale model of the hall, supervised the installation of exhibits, and worked closely with the History Division to plan the historical summary on which the hall is based. □

Donald Chaput is the supervising curator of the Garland Hall of American History, Natural History Museum of Los Angeles County.

"It was a Gas" Or a Short History of the Reliable Range Co.

by **Bruce R. Lively**

The Schneider and Trenkamp Reliable Gas Range (c. 1910) in the new Garland Hall is a fascinating example of how thousands of innovative little businesses of the late 19th century blossomed into giant industrial corporations. Paul Schneider, Henry Trenkamp and some partners established a foundry in March, 1893 at Cleveland, Ohio. Trenkamp was elected president of the company in 1895, bought Schneider out in 1902, and from that time on the Trenkamp family controlled the growing foundry business.

By then homemakers were slowly abandoning wood, coal and kerosene-burning stoves in favor of gas-burning models, constructed of cast iron with a bake oven below the cooking top. It was natural for a foundry such as Schneider and Trenkamp to pioneer in the manufacture of gasoline stoves. It had been casting iron for years and began assembling stoves sometime before 1900.

On January 7, 1902, Schneider and Trenkamp merged with eight other infant manufacturers of gas-stoves to form the American Stove Company. During the next decade, the development of natural gas caused a great boom in the gas-stove industry and American Stove became a regional leader.

It took considerable skill to bake on an early gas stove. The temperature had to be just right lest the food emerge undone or burnt. Some of the best cooks placed a chicken feather on the oven, then "read" the temperature by how badly the feather was singed. Another method was to hold your hand in the oven and count. If you could keep it there only to the count of 20 the oven was "quick." A count of 40 meant a "moderate" oven, and a count of 50 to 60 indicated a "slow" oven. To cool the oven after cooking the chef simply opened the door.

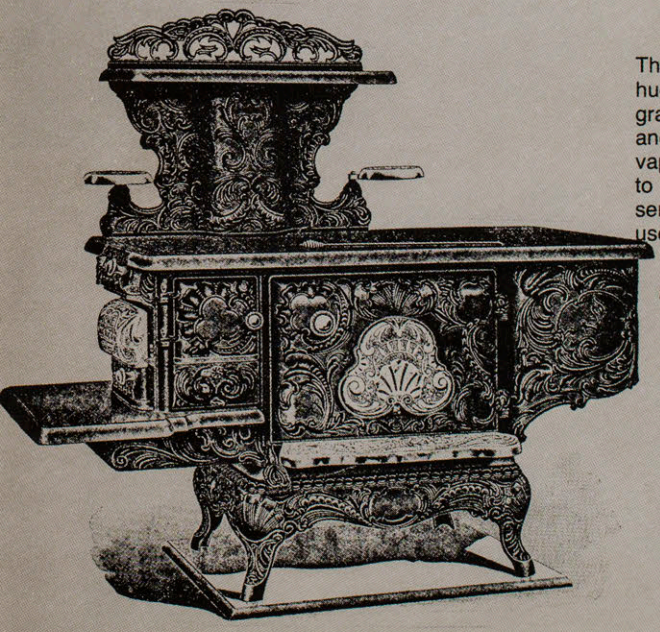
The Schneider and Trenkamp Reliable Range in the Garland Hall cost between $20 and $25, ran on gasoline or natural gas, and came with countless accessories. Advertisements claimed that the "Total Time from Lighting Until Everything was Ready to Serve" was only "One Hour and Fifty Minutes," a far cry from microwave speed. Savings over coal were estimated at about 46%.

The next major advance in ovens came in 1913 when the American Stove Company invented the temperature regulator. According to company legend, a ten-year-old boy came home from school to find his mother in tears over a loaf of burnt bread. Then and there he determined someday to rescue future mothers from the same humiliation. As an adult he went to work at American Stove and adapted a hot-water heater thermostat for use on an oven. Thus, the American Stove Company Lorain Red Wheel Oven Regulator revolutionized baking.

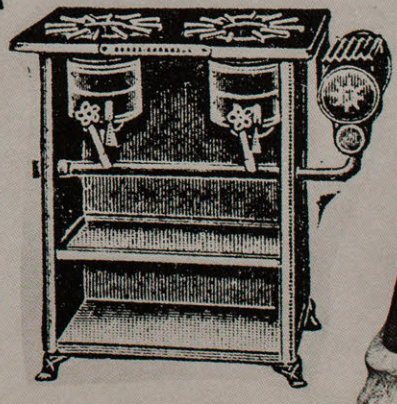
In 1929 American Stove developed a popular new model called "the Magic Chef," which was radically different in design. With it the company easily weathered the Depression, and in 1944 American Stove ran operations in nine cities. A nation-wide concern by the late 1940's, American Stove encouraged Trenkamp's descendants to build a new plant in downtown Cleveland. There castings were made for stoves, washing machines, water heaters, electrical equipment and even automobiles. Today Magic Chef ranges are known throughout the world. □

Bruce Lively is Museum Education Specialist, Natural History Museum of Los Angeles County.

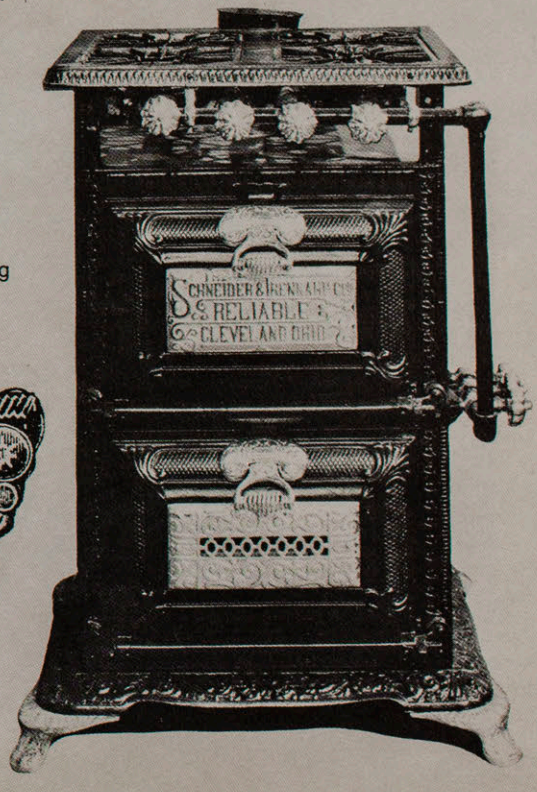
The Schneider and Trenkamp Reliable Gas Range (C. 1910)

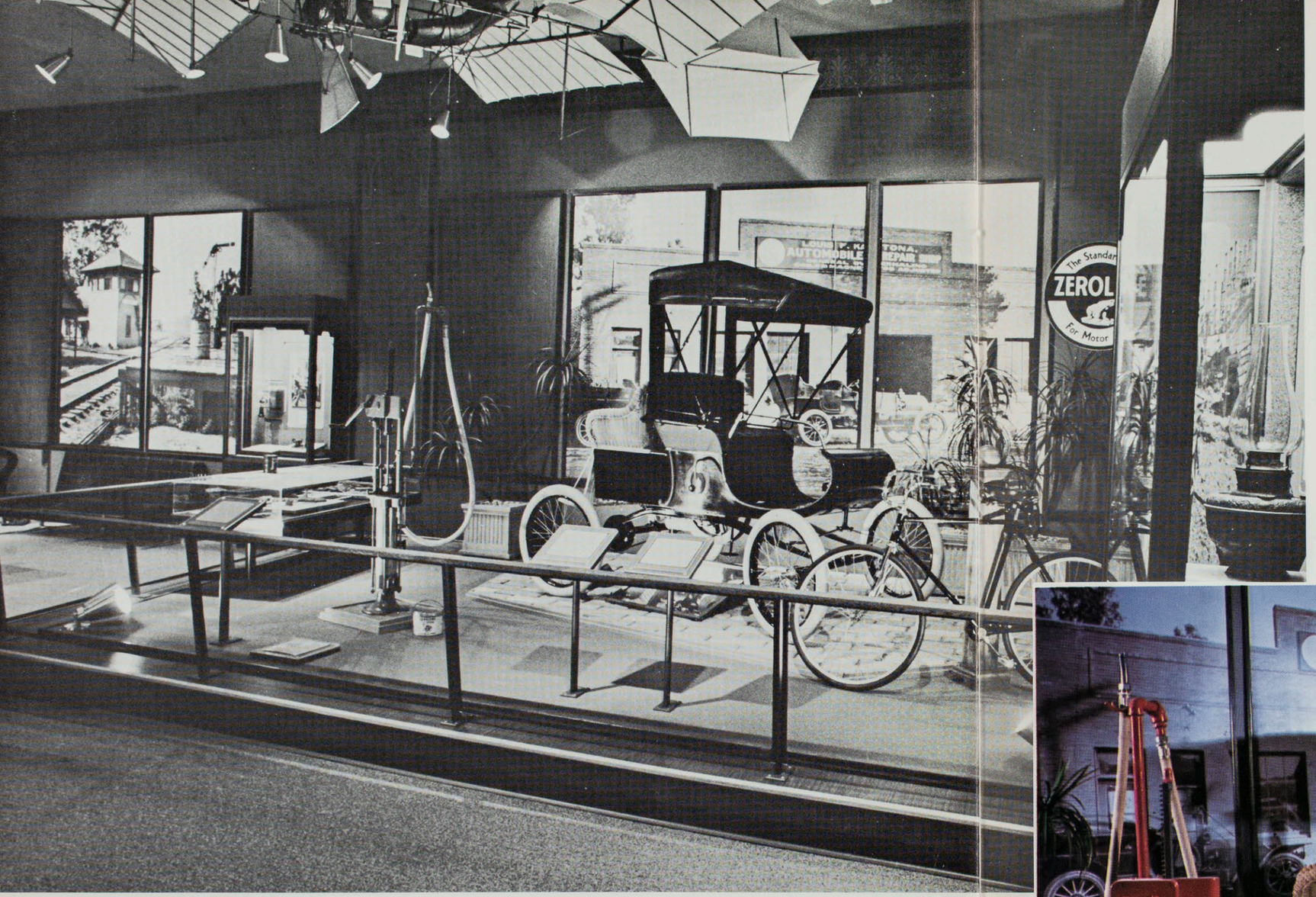


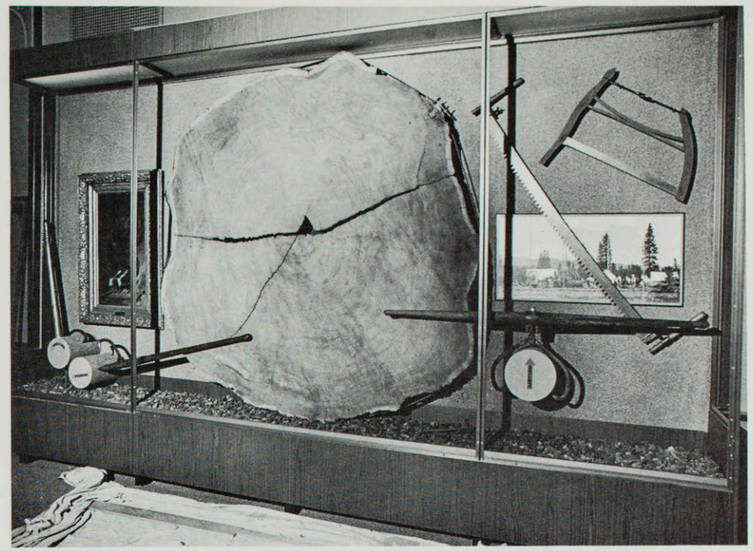
The first kerosene stoves were like huge oil lamps with one wick and a grating over the top to hold the pots and pans. Early naptha stoves mixed vapor and air and left a stench clinging to furniture and wallpaper, while seriously endangering the eyes of users.



Wood and Coal stoves were the standard through the 1870's, before kerosene and Naptha models came into wide use in the 1890s. The latter had appeared about thirty years earlier but were used mainly as "summer stoves," because they did not produce additional heat to keep the kitchen warm in the winter.







Garland Hall

Garland Hall

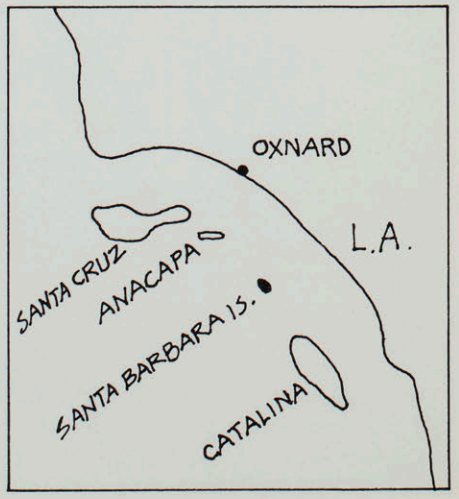
(continued from page 2)

fore found on any of the Channel Islands, thus raising several scientific possibilities. Myra Hester, Museum Registrar, saw that a cliff in Cave Canyon was made up of shells and many other components and so was certainly not the pure volcanic material that previous research had said that it was. One Alliance member, being a poor camper, rose at dawn to hike to a cliff above one of the sea lion rookeries; to her amazement she found that the sleeping sea lions numbered over a thousand — at a time of year when scientists say the sea lions have dispersed.

We learned that it is fine to escape the pressure of city life and be simple — although no one could call Peggy McCain's cuisine of steaks, clam, spaghetti, stew, and the young cooks' catch of abalone (pounded cheerfully by several children) exactly simple. We learned how satisfying it is to have plenty of time to study a few things thoroughly. We learned some science, made new friends, and vowed to be first on the sign-up the next time the Museum Alliance plans a deep look into an interesting place.

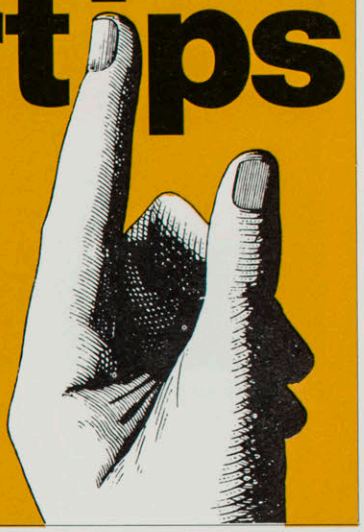
Fran Kellough had better watch out; applicants will create a heavy surge.

— K.B.



At Our Fingertips

Claws, Hoofs and Nails



by **Kilbee Brittain**

photos by Dorothy Petrula

"Don't let your nails grow too long, or file them into points, or they will look like claws!" advised a well-known magazine in August 1975. The reader, after all, must not give up membership in the Primate Club, restricted to lemurs, monkeys, apes, and us. We creatures have fingernails. Most land vertebrates have claws, although there is another restricted group, the ungulates, which have hoofs.

Whether claws, hoofs, or nails, the growths of hardened skin cells on the ends of our fingers and toes make many endeavors of the animal kingdom possible. Scratching, running, kicking, digging, grooming, cleaning, climbing, hanging, foraging — all are enhanced by the presence of claws, hoofs, or nails. These cells are made of a protein material called keratin, from the Greek *keratos,* meaning "horn." (The Latin word is *cornu,* recognizable to us in "corns," the unfortunate horny bumps on feet.) The same substance also makes hair, feathers, scales, beaks, horn sheaths, turtle shells, warts on toads, dandruff, and rough patches on aging skin.

The skin from which claws, hoofs, or nails begin to grow is called the matrix. Keratinized cells grow steadily from this matrix into their genetically determined shapes until they are worn away at the finger or toe tip. Between these mostly dead cells and the normal skin there is a layer of cells called the subunguis.

The basic type of hardened digit tip is the claw, shared by reptiles, birds, and most mammals. Claws grow around the top and part of the sides of digits, curving over the tip for further protection.

No one knows exactly when claws first evolved on the four-footed descendants of those first amphibians that struggled over land from pond to pond hundreds of millions of years ago. Fossil feet do not always survive intact, nor do the claws on those feet; sometimes, however, imprints of claws survive in fossil footprints. In the many years of changing forms, some animals "lost" certain fingers, while in others, certain digits became fused; other animals retained the full five. But however many fingers and toes there were, they were tipped with claws early in the history of land vertebrates.

Ancient reptiles large and small had claws to be used in attack or defense. Their descendants use claws in more humdrum activities. Turtles and alligators have large claws useful for traction and for digging; land iguanas of the Galapagos grasp rocks and branches with their claws. The smallest lizards can use their delicate claws in a fury of digging to bury themselves or their eggs, or to hang on to whatever they are climbing.

The earliest bird, Archaeopteryx, had claws. Three skeletons of this remarkable pioneer were found in Germany in stone of the Jurassic period, one hundred and eighty million years old. The feet were clawed, and the wings, as yet not fully developed, bore three fingers with claws. Modern bird feet usually have four clawed toes, and the three fingers, buried in the wing, are not clawed.

Bird feet and claws are extremely diverse. Toes and claws of the parrot family can curve tightly around branches, and can pick things up with one foot; eagles can grasp rabbits and rodents while the predator soars to its nest; the large flat clawed feet of ostrich (the only two-toed bird), emu, cassowary, or rhea give firm footing for these heavy, flightless birds, as well as being able to deliver a devastating kick. Cassowaries, in fact, can disembowel a man by slashing with the knife-like claw on their inner toes, and are bad-tempered enough to try it, too.

Claws must have served early mammals well, as they scurried under bushes to eat insects or to dig up and eat reptilian eggs. Almost all carnivores have claws, to deliver a first blow, and to hold their prey down while biting. Bears dig their huge, curved claws into trees while climbing; their claws tear off bark to mark territories, rip open ice chests or tents or bee hives, pin down fishes, or maul a victim. The power of such claws was recognized by the American Indians, who made bear-claw necklaces.

Claws give the dog family, which walks digitigrade (on its toes) protection for the soft tips of feet, as well as traction. Claws are indispensible for digging dens, burying bones and then digging them up, and scratching at fleas and screen doors. Claws protruding from sea lions' flippers help these marine mammals navigate over slippery rocks and soft sand as well as giving a good scratch to salt-soaked skin.

Cat claws are sharper than dog claws, perhaps because cats must pounce and secure their prey promptly, while dogs run their prey to the ground. The retractible nature of their claws allows cats to keep such sharp weapons out of the way while moving about or playing with companions. Sharp claws help a cat as large as a leopard climb trees. The cheetah is the only cat that cannot retract its claws, and, appropriately, it races dog-like after prey, at speeds of sixty or more miles per hour.

One of the ways to tell dog from cat footprints is to look for claw imprints: there are none in cat prints, since they retract the claws.

Squirrels and other rodents climb trees by digging claws into the bark and hold food between two paws with claws tightly pressed against their treasure.

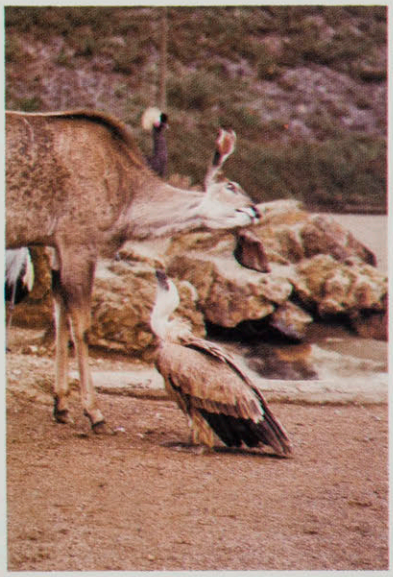
continued

Galapagos land iguana

Moluccan cockatoo
(parrot family)

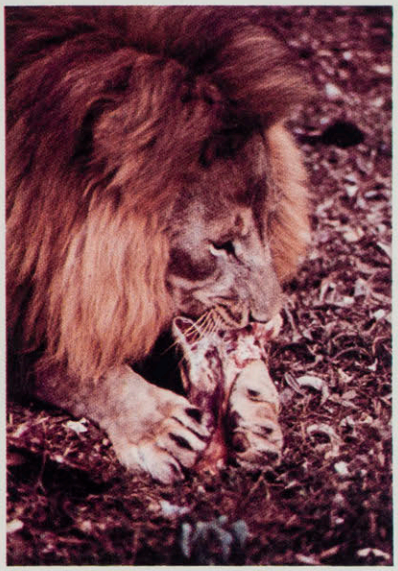
Harpy eagle

Bald eagle



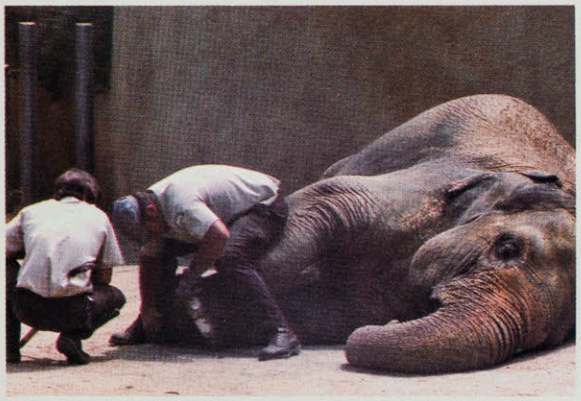
Hoof and claw:
kudu with
African vulture

Cassowary feet



Lion retracts
unneeded claws

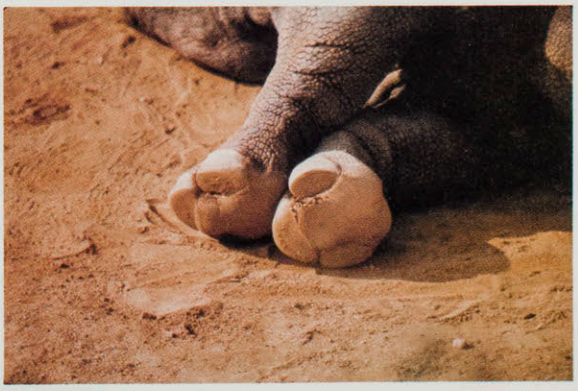
Kodiak bear



An elephant pedicure
at the Los Angeles Zoo

Rhino foot

Rocky Mountain sheep



Rhino foot
showing pad
between hoofs

Many mammals have claws adapted to special needs: moles' claws are huge in proportion to their bodies, but necessary for a life spent digging tunnels. Anteaters' large curved claws are good for ripping open old logs or termite nests, as well as providing dramatic defense for these toothless animals. Sloths' curved claws allow these odd, sleepy creatures to hang upside down indefinitely without fatigue. Kangaroo claws, already well formed when the baby is two inches long and five weeks beyond conception, help the newborn to creep from the birth canal into its mother's lifegiving pouch. When adult, kangaroos have an impressive weapon in a long "grooming claw" on the back feet. The hare-lipped or fisherman bat of South America "fishes" at night with long claws; many bats hang upside down by clawed feet, and also have a "thumb" claw extending from each wing.

Hoofs make their first appearance in the Tertiary Age, some seventy million years ago, as early ungulates (from Latin *ungula,* hoof) evolved. These mammals had a reduced number of toes, and walked on toe tips. Ancestral claws became shorter and broader, encasing digits like half a cylinder, with the subunguis forming a pad inside the curve of the hoof.

The two orders of recent ungulates, Perissodactyls and Artiodactyls, are so divided on the basis of their toes. Perissodactyls include horses, tapirs, and rhinoceroses; these are the odd-toed ungulates that in their early evolution lost toes one and five, that is, big toe and little toe. Eohippis, the small "dawn horse," still had four hoofed toes on the front feet, but three on the back. In later horses, only toe three survives, encased in one strong hoof. Yet evolution does not progress in a straight line: one strange Perissodactyl, the extinct Chalicothere, was a large horse-like animal with heavy claws which perhaps developed to aid in digging up roots and bulbs to eat. Rhinoceroses and tapirs retain the three hoofs.

Artiodactyls, the even-toed ungulates, include deer, antelopes, sheep, goats, cattle, camels, pigs, giraffes, and hippos. They first lost the big toe, then the two side toes, with middle toes three and four forming what is called a cloven hoof. Sometimes toes two and five survive, but usually only as vestiges, an exception being the hippopotamus.

Do hyraxes and elephants have hoofs or nails? Because of their feet, hyraxes, small, furry rock-dwellers in Africa, are thought to be very distantly related to elephants, which have three or four hoof-like nails on the hind feet and five on the front. Some authorities say hyraxes and elephants have hoofs, some say nails, some say hoof-like nails and others say nail-like hoofs. The odds favor "hoof-like nails" because the "nails," while much stronger and thicker than any fingernails primates possess, do not extend all the way around each digit, and so cannot be called hoofs.

Hoofs provide sure footing, a good hard surface for running away from clawed carnivores, and a mean kick if caught by a predator. As with claws, hoofs have adapted to many uses. Sheep and goat hoofs have sharp edges useful in climbing rocky areas; the undersides are concave and act somewhat like a suction cup. Other hoofs are good for digging truffles, or moving like sandals through the Arabian sands.

Nails are claws which have become broader and flatter. They probably evolved along with the grasping hand unique to primates. As primates evolved perhaps from primitive insectivores like tree shrews, their hands changed from paws into fingers that could close down toward the palm, around a branch or a piece of food. If fingers can clasp a branch, the hand does not need claws to dig into the bark.

Prosimians, early primates like lemurs, cannot move their fingers around separately as we can, but they can grasp, and they have nails, not claws, except for a grooming claw on some back feet. The only clawed monkey, in fact, is the South American marmoset, which runs squirrel-like through the trees.

The grasping hand with nails makes possible activity denied other animals. Primates use their hands and fingers for delicate activities that would be impossible if claws curved over their fingertips. Many primates have thumbs that are opposable in varying degrees, that is, their thumbs and any of their fingertips can be brought together. This enables such fortunate creatures to pick up whatever they choose, however small it is, with just one hand. Nails aid monkeys and apes in their incessant grooming activities, poking or scratching through each other's hair and then picking up and intently examining whatever they find.

Human nails are still less curved than other primate nails. The crescents of our nails are the cells near the matrix, which carry less blood and therefore show white; they are known as the lunula (from Latin *luna,* moon). The rest of the nail shows pink because the capillaries show through the translucent layer of dead cells. If a nail is pulled off, it will grow back unless the matrix has been too badly hurt.

Since claws, hoofs, and nails grow continuously, something must happen to them at the tips or we would all be incapacitated. In the wild, animals wear down the old growth by running or scratching. Monkeys and apes wear their nails down by picking at objects and by grooming each other. They can do what only mothers, lovers, and hairdressers are allowed to do in human society — run their fingers through each other's hair. The result seems to be nicely manicured primate nails.

Domesticated or captive animals, however, often need human help in keeping their claws or hoofs in shape. Horses need shoeing in a cement society or a racing life. Dogs that stay in houses often need claws trimmed. Pet cats are often declawed, which means amputating the first joints of their front paws, behind the matrix of the claws. Zoos sometimes trim elephants' "nails," but would have a terrible time giving less tractable animals a pedicure.

Most humans trim their nails every week or two in straight or oval shape, mostly for convenience but also for appearance, since only the unkempt or the inhuman, like werewolves or Draculas, have long nails like claws. Equally unattractive are nails bitten or broken past the fingertips, and they are not useful, as anyone with broken nails who has tried to pick up a very small object like a needle can testify.

Despite the resulting inconvenience in typing, playing the piano, or doing just about anything interesting, fashion has from time to time decreed longer nails for women, sometimes with colored polish as in Egyptian and modern times, sometimes with the crescent left clear. Some women who break their nails buy false ones to stick on top of their own battered variety. In the Orient some cultures encourage men to grow one nail extremely long, as a sign that they do not have to work with their hands for a living.

Nails are a good indication of one's general health. Doctors can diagnose ailments like thyroid or vitamin deficiencies from looking at brittle, ridged, thin nails with no snap or strength.

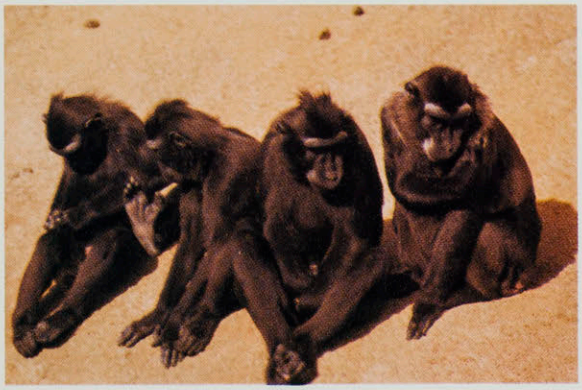
Nails are an important part of life in the Primate Club. When you hoof it to the office to claw your way up life's ladder, remember that you have already arrived: the answer is at your fingertips. □

Until she wrote this article, Kilbee Brittain wondered if zoo monkeys bit their nails, or if keepers held them still to give them manicures.

Photographer Dorothy Petrula is in her eighth year as a docent at the Los Angeles Zoo, where she took all the photographs.

Orangutan hand

Orangutan foot



Macaques inspecting
hands and feet

Golden marmoset,
the only clawed monkey

Gelada baboons
grooming
each other

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